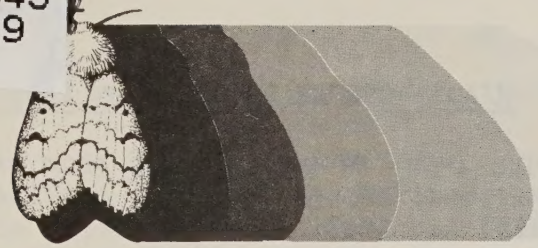

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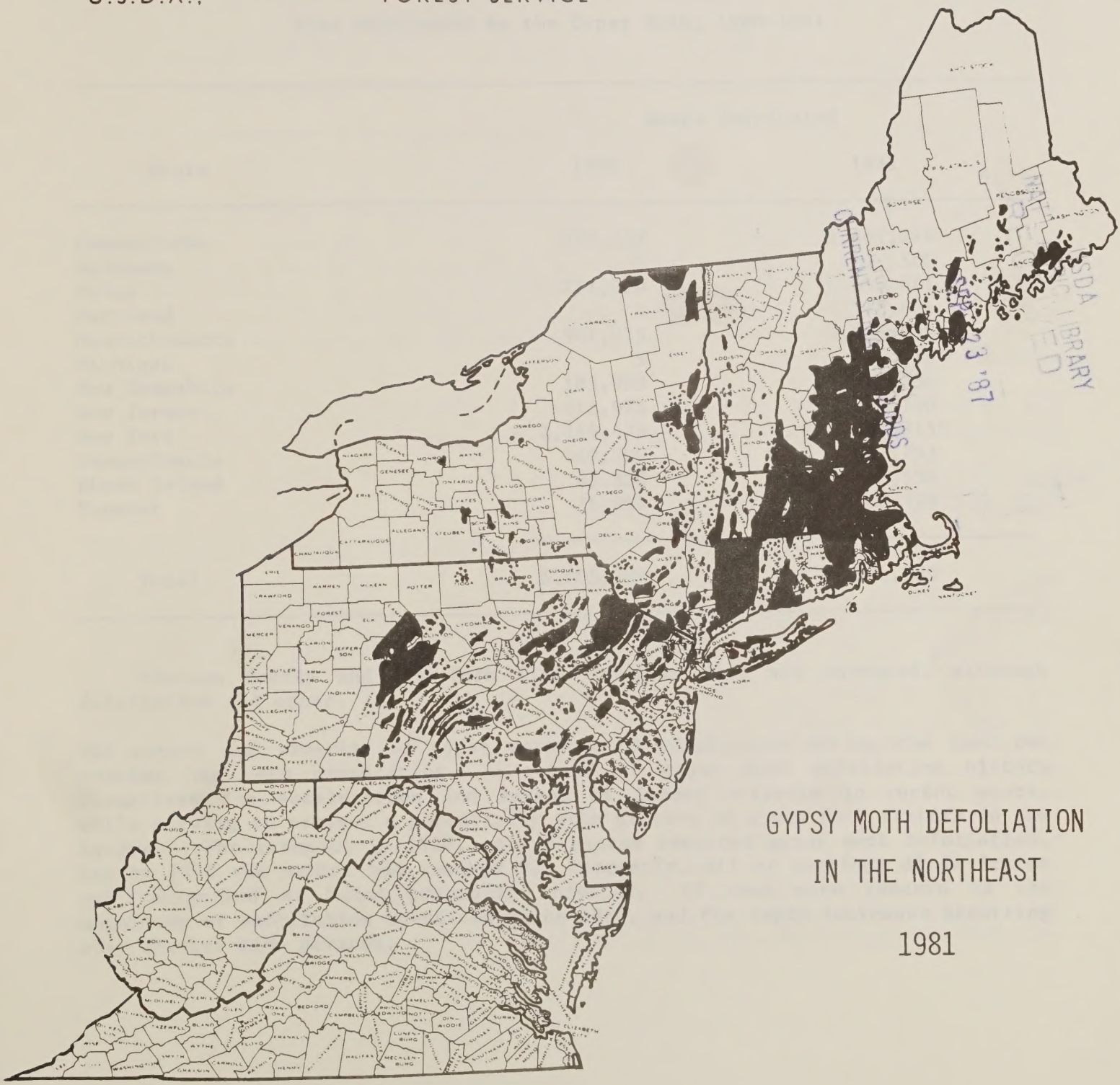

GYPSY MOTH DEFOLIATION IN THE NORTHEAST

1981

Compiled by Forest Pest Management Staff, Morgantown, West Virginia

GYPSY MOTH BREAKS RECORD--AGAIN

As most of you readers know, gypsy moth was quite busy in 1981. A record 12.8 million acres in the Northeastern States and Michigan was defoliated according to aerial surveys conducted this past summer. This is a new single year high and exceeds by more than 250 percent the old record set in 1980. Increases were noted in every State except New York and Vermont.

Area Defoliated by the Gypsy Moth, 1980-1981

State	Acres Defoliated 1980	1981
Connecticut	272,213	1,482,216
Delaware	0	500
Maine	221,220	655,841
Maryland	3	8,826
Massachusetts	907,075	2,826,095
Michigan	5	18
New Hampshire	183,999	1,947,236
New Jersey	411,975	798,790
New York	2,449,475	2,303,915*
Pennsylvania	440,500	2,527,753
Rhode Island	43,830	272,556
Vermont	75,094	48,979
Total	5,005,389	12,872,725

*Nassau County and New York City counties were not surveyed, although defoliation did occur.

The extent and severity of gypsy moth-caused defoliation during the last two seasons has been devastating. A review of gypsy moth defoliation history dramatizes the acceleration and spread of insect activity in recent years, while serving to project a potentially grim picture of gypsy moth threats in the future. For example, in 1924, only 3 States reported gypsy moth defoliation, but by 1970 the number had reached 9. Currently, all or portions of 12 States are recognized as being generally infested. Of even more concern is the magnitude of defoliation sustained since 1924, and the rapid increases occurring over shorter time periods.

History of Gypsy Moth Defoliation, 1924-1981

Period	Acres Total Defoliation	Total Cumulative Defoliation
1924-1969	11,955,486	11,955,486
1970-1979	11,640,705	23,596,191
1980-1981	17,878,114	41,474,305

From 1924 to 1969, the gypsy moth defoliated more than 11.9 million acres, but during the period 1970-1979, it took only 10 years for the insect to defoliate 11.6 million acres, almost the same amount as it required 46 years to defoliate. In the past 2 years, the gypsy moth has defoliated more than 17.8 million acres--a 50 percent increase above total acreage defoliated in the previous 10 years. To date, the total acreage defoliated by the gypsy moth since 1924 exceeds 41 million acres.

The prognosis for 1982 and beyond is uncertain; but what is certain is that the gypsy moth is here to stay.

1981 COOPERATIVE SUPPRESSION ACTIVITIES

The Pennsylvania Bureau of Forestry reports that the 1981 gypsy moth suppression operation was the largest ever undertaken in the State, with a total of 190,468 acres treated in 38 counties. The spraying included 179,178 acres of State and private land treated under the Forest Service Cooperative Gypsy Moth Suppression Project and 11,000 acres of campgrounds treated for regulatory purposes to retard interstate spread of the insect. A total of 175,178 acres was treated with Dylox; 11,000 acres (campgrounds) with Sevin; and 4,290 acres with *B.t.* The high density gypsy moth population, which averaged 4.5 million caterpillars per acre, reduced the time available for proper application by one-third. Bad weather also severely hampered suppression efforts. Many areas were heavily defoliated before they were sprayed and will qualify for respraying in 1982.

The spread of the insect in 1981 occurred at a rate of about four times that normally experienced. The 1980 drought and several windy days in the spring were large contributing factors. The 1981 defoliation set a record for Pennsylvania. Infestations showing noticeable defoliation occurred in 46 counties covering the eastern three-fourths of the State.

Cooperative State/Federal Gypsy Moth Suppression Projects, 1981

State	Acres Treated	Acres Treated/Insecticide
Maine	465	465 - B.t.
New Jersey		
Agriculture	60,524	47,808 - Sevin 12,716 - B.t
Forest Management	15,300	15,300 - Sevin
New York	60,917	35,420 - Dylox 20,532 - Sevin 4,965 - B.t
Pennsylvania	190,468 1/	175,178 - Dylox 11,000 - Sevin 4,290 - B.t.
Rhode Island	22,625	22,625 - Sevin

1/ Includes 11,000 acres of campgrounds treated for regulatory purposes.

BODY RASHES ATTRIBUTED TO GYPSY MOTH

The Pennsylvania Department of Health studied the incidence of skin rashes among students in two Luzerne County schools between the last week of April and the third week of May 1981. One school had an attack rate of 42.2 percent among students, the other a rate of 25.3 percent. The rashes generally occurred on the exposed areas of the body and lasted about 7 days. Similarly, more than 1,000 cases of skin rashes were reported in Bristol, Connecticut, during the same period. In both cases, the appearance of body rashes coincided with the presence of early instar gypsy moth larvae.

GYPSY MOTH REPORTED IN 28 STATES

Adult male gypsy moths were trapped in 18 States and the District of Columbia during 1981 in addition to the 11 States considered generally infested in the Northeast. Based on the reports received by USDA, the following summarizes the gypsy moth status outside of the Northeast:

ALABAMA	Multiple trap catches near Mobile and Fort McClellan.
ARKANSAS	Multiple trap catch in Fulton County. Plans in 1982 to treat 1,500-3,000 acres around a junkyard where egg masses were found. New infestation near Hardy.
CALIFORNIA	Moths trapped in Monticello and San Juan Capistrano.
DISTRICT OF COLUMBIA	Heavy moth catches in the area near Bethesda, MD.
FLORIDA	Over 73 campgrounds with moth catches, at least 35 of which were multiple trap catches.
GEORGIA	Male moths trapped in 5 counties. Moths trapped at Jekyll Island and north of Marietta.
ILLINOIS	Male moths trapped in 13 counties, the heaviest in the Chicago area. Several new infestations reported; primarily in counties near Chicago.
MICHIGAN	Moths caught at 4 locations outside of the 5-county generally infested area, including Traverse City.
MINNESOTA	One hundred eight moths trapped at 63 sites in the Twin Cities and Rochester area. The insect may have been brought in on nursery stock from New England.
MISSOURI	Moth catches in 5 counties.
NEBRASKA	Moths detected in Lincoln for a second year in a row.
NORTH CAROLINA	Moth traps in 34 counties, many with multiple catches. Concentrations in counties along the outer banks and north of Raleigh-Durham.
OHIO	Moths trapped in 59 counties; 15 counties for the first time.
OREGON	An infestation was treated near Salem. Moths detected in an area 1.5 miles from the treatment area.
SOUTH CAROLINA	Moths caught in 10 counties, especially along NC border and Jasper County. New infestation near Little River. Concentrations of catches in recreation areas from Myrtle Beach to Georgetown. Caste larval skins and 48 moths detected at Windjammer Village in Horry County.
VIRGINIA	More than 20,000 male moths caught in 1981 compared with 1,700 the previous season. Concentrations of moths caught along the coastal areas, and northern counties. Considering designating northern tier of counties generally infested.

WEST VIRGINIA	Moths caught in 24 counties; 14 counties for the first time. Three eastern panhandle counties reported the presence of all gypsy moth life stages.
WASHINGTON	Several moths trapped in the Seattle-Everett area and north to Vancouver, B.C.
WISCONSIN	One hundred fifty moths detected in Madison and one outlying area northeast of the city.

APHIS cooperated with the States of California, Illinois, Michigan, Nebraska, Ohio, Oregon, Virginia, Washington, and Wisconsin (see May 1981 newsletter) to eradicate small infestations.

The Michigan Department of Agriculture reported that 1,500 acres were aerially treated with carbaryl and 500 acres were treated with B.t. followed by a later application of disparlure. Some 20,000 pheromone traps also were deployed in the area.

PENNSYLVANIA IPM DEVELOPMENTS

Work continued in developing the methodology to be incorporated in an integrated pest management (IPM) system for the gypsy moth utilizing Bacillus thuringiensis (B.t.) and the parasite, Apanteles melanoscelus. Studies conducted in 1980 in cooperation with APHIS, showed that a sublethal dosage of B.t. delayed death of the gypsy moth for an extended period before succumbing to starvation. During this period of retarded growth of the gypsy moth, the early instar parasite, A. melanoscelus, is able to significantly extend its parasitization activity and increase parasitism rates beyond what occurrs naturally in areas not sprayed with B.t. This synergism between B.t. and A. melanoscelus is the key factor in the IPM system currently being developed.

In the 1981 tests, another component of the system was added--augmentative releases of laboratory-reared parasites after a single application of B.t.

1981 A BUSY YEAR FOR METHODS CENTER

Otis Methods Development Center Director, Dr. Charles Schwalbe, reports that 1981 was another active field year for the Center. In addition to a sterile male moth effort in Michigan, which is discussed in a separate article, Otis was involved in several other projects, summaries of which follow.

Field work with disparlure for mating disruption has been progressing steadily with demonstration projects in Wisconsin and Michigan. An infestation in Wisconsin was reduced in size and density using this material and 1982 surveys will tell if eradication was achieved. Small test plots in Massachusetts gave further insight into population density and application rate constraints of the technique. It appears also that an infestation in Illinois was eradicated with 2 consecutive years of B.t. spraying and mass trapping at the rate of 3 traps per acre. Final conclusions must await the findings of the 1982 survey.

Approximately 3,000 pounds of frozen, virus-infected larvae were produced in 1981. The cadavers are being freeze-dried at the Smithsonian Institution's Museum of Natural History. This material will be used in future formulation efforts and other field tests.

Three 1,000-acre blocks in Pennsylvania were treated with the insect growth regulator SIR 8514 at 0.06 lb/acre. The foliage protection and excellent population control that were achieved confirmed effectiveness under operational field conditions. This is a prerequisite to successful registration of the formulation.

Finally, field test results in Massachusetts suggest that it may be possible to eliminate the costly second application of B.t. by adding sticker and increasing dosage. These data are encouraging; however, more field testing is necessary.

TO STARVE A GYPSY MOTH

Gypsy moth antifeedants, chemicals that deter or prevent insect feeding, have received considerable attention since the early 1970's. Forest Service scientists at Hamden, CT, have been evaluating many of these substances.

The test procedure is both simple and realistic, according to research entomologist Mike Montgomery. Solutions or emulsions of the test chemicals are sprayed on oak leaves. A test leaf along with a leaf sprayed only with the appropriate solvent are presented to fourth instar gypsy moth larvae. Several of the chemicals bioassayed to date have gypsy moth antifeedant activity, but none is a promising subject for further development. For example:

NEROLIDOL, extracted from a tree native to Malaysia, is phytotoxic to oak leaves, even when used at concentrations that reduce insect feeding 30 percent.

NEEMOIL, extracted from a tree native to India, must be used in relatively large doses before gypsy moth feeding ceases. The oil is structurally complex, and isolation and production of the antifeedant component is likely to be cost prohibitive.

COUMARIN, an easily synthesized molecule found naturally in many plants in the parsley family, completely prevents gypsy moth feeding at rates as low as 0.1 lb/acre; however, it is a suspect carcinogen.

Screening will continue despite the poor prospects of discovering an antifeedant that can meet all the necessary prerequisites. By working with readily available materials instead of isolating new ones, we can minimize the cost of increasing our understanding of the role of chemicals in gypsy moth feeding behavior. This knowledge will help in the search for antifeedants and will assist in learning which factors affect the resistance of a host plant to gypsy moth attack.

VIRUS AND SHREWS: GYPSY MOTHS LOSE

Forest Service scientists John Podgwaite and Harvey Smith are studying the feasibility of using NPV (GYPCHEK) and the small mammal predator complex in an integrated management scheme to dampen rising gypsy moth populations and maintain them at innocuous levels in homeowner woodlots. Early gypsy moth larval stages are highly susceptible to NPV while the large larval and pupal stages of the insect are impacted heavily by the small mammal predator complex. When egg masses are treated with NPV prior to hatching, a large percentage of emerging larvae will ingest the virus and die. The larval cadavers will contaminate foliage and serve as foci of infection for surviving, susceptible larvae. The small mammal predator populations, primarily mice and shrews, are provided with protected nesting locations in brushpiles and food in winter months. Theoretically, the increased predator load will result in a proportionately heavier impact on insects surviving the egg mass treatment.

In both the first and second years of the study, more than 85 percent of the larvae hatching from field-collected egg masses that were treated with NPV died from the virus. Also, NPV-elicited larval mortality (instar 3-6) was significantly higher in NPV treatment plots than in the control. This indicates that NPV-killed first and second instar larvae may have provided foci of infection for later stage insects. Provision of brush piles appeared to increase small mammal numbers in some areas. Food will be provided beginning this year as will testing for small mammal impact.

These preliminary data are encouraging and indicate the potential for the integration of these biological systems into gypsy moth management strategy.

MICROBIALS EVALUATED

The Forest Service (NEFES) conducted two field tests of the microbial insecticides B.t. and GYPCHEK during the past field season in Connecticut. The first test was conducted at Harwinton, CT, in cooperation with the Connecticut Agricultural Experiment Station and the Connecticut Department of Environmental Protection (DEP). The objective was to evaluate double applications of each of two new strains of B.t. (HD-243 and HD-263) against one and two applications of the strain (HD-1) used in commercial B.t. preparations. All strains were prepared as Dipel 4-L formulations and applied at a dosage rate of 8 Billion International Units per acre.

Forest Service scientist Normand Dubois reports that all four treatments provided foliage protection compared to the untreated areas. Specifically, the double application of the HD-1 strain provided significantly better foliage protection than the single application (net defoliation of 9 percent versus 31 percent). Net defoliation estimates in areas treated with the HD-243 and HD-263 strains were 20 and 19 percent, respectively. Untreated areas experienced an average of 53 percent defoliation.

The second field test involved aerial application of two GYPCHEK formulations and was carried out on the Cockaponset State Forest in cooperation with Forest Pest Management (NA-S&PF), Connecticut DEP and Connecticut Agricultural

Experiment Station. Two dosages of GYPCHEK (25 and 125 x 10^6 potency units per acre) were applied in ProTec at 2 gallons finished spray per acre. One dosage of GYPCHEK (25 x 10^6 potency units per acre) was formulated similar to "4L" by Abbott Laboratories, Inc., and applied at 2 gallons finished spray per acre. All treatments were applied twice about a week apart and treatments were replicated 3 times.

Gypsy moth populations were very high in the treatment area according to research project leader Frank Lewis. Mean defoliation levels were: 94 percent, low dose ProTec blocks; 69 percent, high dose ProTec blocks; 67 percent, 4-L blocks; and 97 percent in the checks. Moderate levels of foliage protection were achieved in several individual treatment blocks, particularly those treated with GYPCHEK "4L". This is encouraging since the "4L" formulation is far superior to any GYPCHEK formulation used in the past. Dr. Lewis plans further tests of GYPCHEK "4L".

STERILE MALE TECHNIQUE: PROGRESS REPORT

As a result of efforts to develop a sterile male technique for gypsy moth control, three USDA agencies--Forest Service (Hamden, CT), Animal and Plant Health Inspection Service and Agricultural Research Service--in cooperation with the State of Michigan, have demonstrated that the technique has practical application. Studies begun in 1978 showed that mass produced, sterilized gypsy moth males were competitive with wild males. In 1979, an isolated gypsy moth population in Benton Harbor, Michigan, was selected and the population delimited to a 1 square mile area. In 1980, approximately 10,000 sterile gypsy moth males per day were released over a 40-day period. In 1981 the gypsy moth population was reduced by 98 percent as a result of these releases. Additional sterile male releases were made in 1981 to eradicate the population.

One of the most important revelations of this research is the potential for using "inherited" sterility in generally infested areas. Adult moths are "partially" sterilized by administering a reduced dose of gamma irradiation (about 1/2 the amount required for complete sterilization). When released, these males will readily mate with wild females who will produce egg masses. Only 30 percent of the eggs in these masses hatch the following year. Larvae that hatch and survive to adulthood are sterile. Subsequent mating by either males or females will result in sterile egg masses. This approach has the potential for debilitating gypsy moth populations resulting in an exponential reduction of population densities.

While one normally thinks of the sterile male technique as having primary value in sparse, isolated infestations, USDA scientists are hopeful that the method may find application in the generally infested northeastern States. An evaluation of the F1 sterility concept is tentatively planned for 1982.

PARASITES IMPORTED FROM RUSSIA

A U.S. team of forest entomologists returned home last June after 3 weeks in the Soviet Union. One of their objectives was to collect gypsy moth larvae and parasites for importation to the U.S. This they did with the help of the Soviet scientists, some of whom are shown in these candid photos taken by Bob Acciavatti (USDA Forest Service).

George Timchenko (Ukrainian Forestry Research Institute) points out some identifying features of parasitic wasps of gypsy moth to Bill Wallner (USDA Forest Service).

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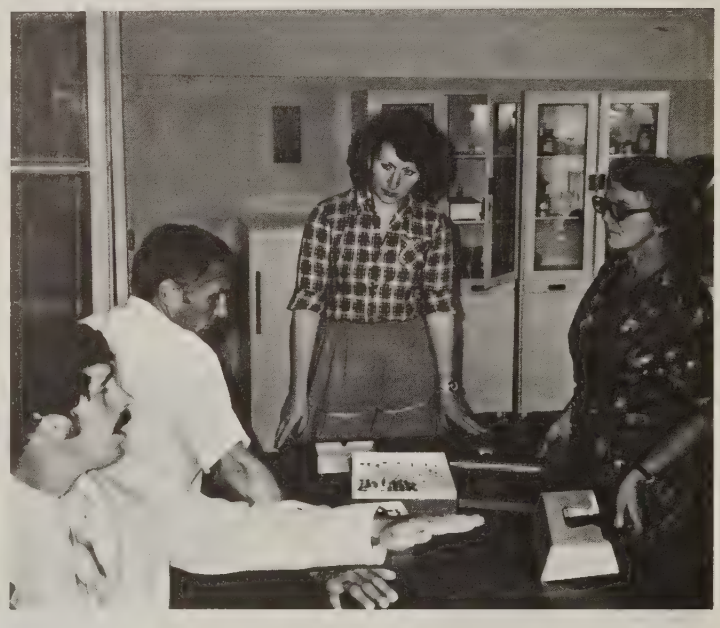
From the left, Mel McKnight (USDA Forest Service) and Mark Ticehurst (PA Bureau of Forestry) collect gypsy moth larvae south of Kharkov, Ukrainian Republic, USSR.

The parasites collected have been cleared through the Beneficial Insect Introduction Laboratory at Newark, DE. Evaluation of Apanteles sp. by Mark Ticehurst (PA Bureau of Forestry) is continuing and C. concinnata is in its third generation under laboratory conditions at Hamden, CT. The parasites B. pratensis and Phobocampe sp. are still under quarantine and are intended for evaluation once it is certain that they contain no hyperparasites.

From the right, Victor Kucheryavenko (Ukrainian Forestry Research Institute) provides Bill Wallner and Mark Ticehurst with tachinid flies for study.

Mark Ticehurst and Bill Wallner discuss importance of parasites collected for US through an interpreter (standing left) with Vera Kupriyanova (All-Union Scientific Research Institute) at Pushkino near Moscow.



Here at home Bill Wallner reports that Forest Service research continues on the potential for two tachinids (Blepharipa pratensis and Compsilura concinnata) to internally and externally vector the gypsy moth nucleopolyhedrosis virus (NPV). Results indicate that B. pratensis can serve as a vector. Studies on C. concinnata are being started at the Hamden laboratory.

Laboratory and field evaluations of the introduced braconid, Rogas lymantriae, are being investigated. It has been determined that R. lymantriae is compatible with the already established Apanteles melanoscelus and neither species excludes the other even when both parasites may simultaneously parasitize an individual gypsy moth larva. Field releases made during 1981 at three Connecticut locations resulted in establishment of life stages in the field. Studies in 1982 and 1983 will continue to determine if the parasite has, indeed, become established. In addition, evaluation of the interaction between the microbial Bacillus thuringiensis and R. lymantriae is underway in the laboratory. The research is intended to determine if low dose B.t. applications are beneficial to the parasite both from the standpoint of enhancement as well as utilization in field establishment of the parasite.

GYPSY MOTH A BUDGET BREAKER

Current Federal budget cutbacks undoubtedly will affect Cooperative Gypsy Moth Suppression project funding in 1982. At present, 10 State agencies representing 9 States in the Northeast have tentatively requested Federal funding in 1982 compared to 5 States last season. These States plan to treat over 1.2 million acres at an estimated cost to the Forest Service of $7.2 million. At last report, USDA Forest Service had only some $6 million available for all types of Cooperative Suppression Projects nationwide, about 20 percent of total demand. The current feeling in USDA is that supplemental funding will not be approved by the Administration this year.

Despite the uncertainty of Federal funding for suppression projects in 1982, project plans and necessary environmental documentation are being developed. Forest Pest Management personnel from Morgantown and Portsmouth Field Offices are working with State cooperators to complete State proposals for inclusion in the 1982 site-specific Environmental Assessment (EA). This will permit Cooperative Suppression Projects to proceed on schedule when Federal funds become available. The final site-specific EA should be completed by early spring 1982.

CONGRESS GETS GYPSY MOTH BRIEFING

Congressional delegations from Northeastern States affected by the gypsy moth were briefed recently by USDA Forest Service and APHIS in Washington, DC. The purpose was to present the current status of gypsy moth in the U.S., project population trends for 1982, and to answer questions from the lawmakers or their staffs.

Also discussed were the proposed 1982 Cooperative Gypsy Moth Suppression Projects including acres to be treated and estimated cost by State, and concerns for the shortage of Federal funds, of trained personnel to supervise suppression efforts, and of qualified commercial pesticide applicators. Attendees were also given literature including a briefing book containing background information on gypsy moth biology, impacts, and suppression history.

APHIS READY TO IMPLEMENT NEW PROGRAM

APHIS hopes to implement a system designed to reduce the movement of gypsy moths via outdoor household articles--the primary cause of isolated infestations near urban centers outside of the Northeast. All preparatory work has been completed and APHIS is now waiting for final approval by Office of Management and Budget. If APHIS and OMB can reach an agreement, the new office would be located in Robinsville, New Jersey.

B.T. EFFECTIVENESS: IT COULD BE THE WATER

The May 1981 issue of THE IPM PRACTITIONER states that the effectiveness of Bacillus thuringiensis (B.t.) may be affected by the pH of the water used to mix it. The bacteria are activated in alkaline conditions like those normally found in the gut of the target larvae. In areas where the water used for mixing has a high pH, it is possible that the B.t. bacteria may be activated before reaching the pest. The article suggests that users test the pH of the water source and buffer it to pH 7 if necessary. Similarly, B.t. users should also consider using unchlorinated water sources if possible as suggested by the USDA Forest Service for the gypsy moth nucleopolyhedrosis virus product, GYPCHEK.

In a related item Forest Pest Management (NA, S&PF) is developing recommendations for the use of B.t. in 1982 Cooperative Gypsy Moth Suppression Projects. These should be available in the spring.

PERSONAL GLIMPSES

Paul Bystrak, Maryland Department of Agriculture, writes that "1981 [was] a year of firsts in Maryland. It was the first year in a decade that we did not have a suppression program; it was also the first year we had extensive defoliation (8,826 acres). For years the problem has become larger and our budget hasn't. We used what little funds we had to spray a few outlying infestations; and, for lack of $30,000, let the rest of it go. The public response was predictable, but still overwhelming. Handling the phone calls, reporters, letters, petitions, TV and radio interviews, and other publicity pretty much used up the summer. I'm sure this is not new to those of you in States that have been infested for years, but it was quite a shock to us. Still, it was a valuable experience...."

"We found first infestations in 9 counties this year [1981], leaving only 4 uninfested counties now. All the infestations found appeared to be related to people movement. Other than the items mentioned above, things went pretty much normally. We trapped the entire State with pheromone traps, but interpretation is going to be difficult because we used plus disparlure this year for the first time. At this time we haven't attempted to determine how much population change has occurred, either from pheromone traps or from burlap data. However, it is apparent that no general collapse occurred, and, in fact, the problem is going to be much worse next year."

"Finally, we had a 'last' this year also. Dr. Robert Altman served his last day in State service on June 30 [1981]. His retirement will leave a leadership void, not only in our State but at the national level as well."

PAST ISSUES AVAILABLE

For those of you who are missing past issues of GYPSY MOTH NEWS, cheer up. Forest Pest Management has a small supply of issue #3 (photo issue) and issue #4 (May 1981) available. If you are interested in extra copies, please write to:

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